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LITTORAL AMPHIPODA OF VICTORIA

Part II

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Abstract

A new species of Victorian Amphipoda, viz. *Orchestia australis*, is described and figured, and the occurrence of two other well known species from this order in Victorian waters is recorded.

Introduction

This paper describes a new Victorian Amphipod species which has been observed in the euryhaline waters of Lake King (Gippsland) and in the marine waters of Port Phillip Bay and Western Port Bay. This new species belongs to the family Talitridae, a family which is morphologically adapted to both aquatic and terrestrial conditions.

The occurrence of well-known species of two other families, viz. Oedicerotidae and Corophiidae, is also recorded in this paper. At present our knowledge of the taxonomy of the Australian representatives of these families and, indeed, of the Australian Amphipods in general is sparse, and it is hoped that the ecological notes provided hereunder will prove valuable.

This work forms the second part of a comprehensive study of the ecological relationships of the Amphipoda of the major bays and inlets of the Victorian coastline. It is hoped that other aspects of this study will be dealt with in subsequent papers.

Family Talitridae

Genus **Orchestia** Pallas

Orchestia Pallas 1766

Type species by original designation: *Orchestia gammarellus* (Pallas), 1766.

Orchestia Australis, n. sp.

Fig. 1A-E, 2A-F

Differential Diagnosis: This form bears a fairly close resemblance to several established species of Orchestia. These are O. *bottae* (1840, Milne-Edwards), O. *gammarellus* (1766, Pallas), O. *chevreuxi* (1887, Guerne), O. *chiliensis* (1840, Milne-Edwards), O. *miranda* (1916, Chilton), O. *marmorata* (1881, Haswell) and O. *Macleayana* (1879, Haswell).

The major distinguishing feature of the new form is the thick fleshy telson which is deeply cleft. In none of the species listed above is the telson more than slightly emarginate at the apex.

Certain features of the 5th peraeopod also enable a clear distinction to be drawn. For example, the 4th segment of the fifth peraeopod in the new form is very slightly expanded distally, whereas in O. *bottae* this is not expanded, and in

O. *gammarellus*, O. *chiliensis* and O. *miranda* the distal end of the 4th segment of both fourth and fifth peraeopods is greatly expanded. In the new form the 6th segment of the fifth peraeopod is almost straight, whereas in *O. chevreuxi* this segment is markedly curved.

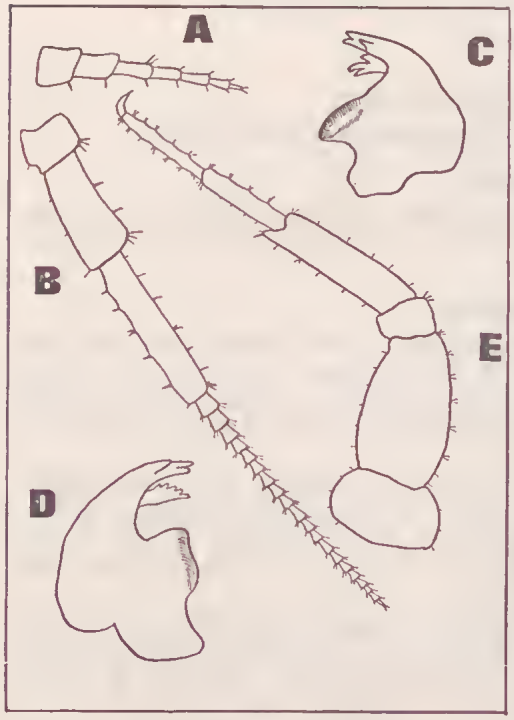

Fig. 1—*Orchestia Australis* (n. sp.)

A. Antenna 1 (c. × 27); B. Antenna 2 (c. × 22); C. Right Mandible (c. × 25) D. Left Mandible (c. × 25); E. Peraeopod 5 (c. × 15).

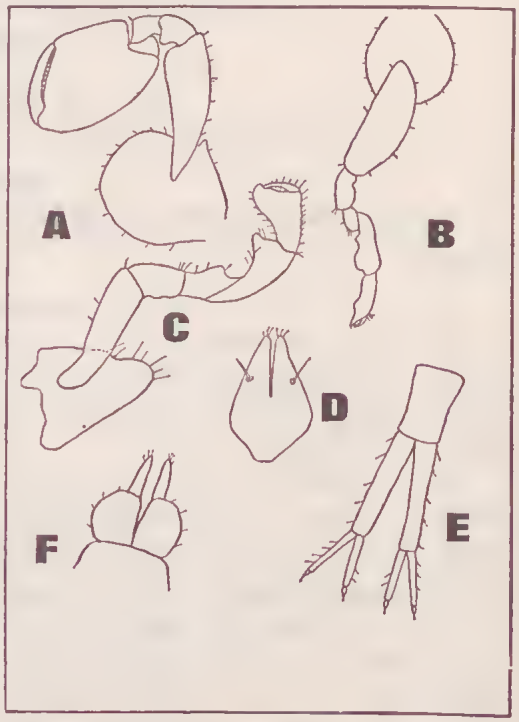

Fig. 2—*Orchestia australis* (n. sp.)

A. Gnathopod 2 ♂ (c. × 12); B. Gnathopod 2 ♀ (c. × 15); C. Gnathopod ♂ (c. × 20); D. Telson (c. × 25); E. Uropod 1 (c. × 20); F. Uropod 3 (c. × 25).

The sixth segment of the second gnathopod in the male of the new species has an oblique palm, not transverse as in O. *gammarellus*, and is ovate rather than widening to the palm as in O. *gammarellus*.

The new species probably bears closest resemblance to O. *Macleayana* which has been observed on the sandy beaches of New South Wales. However, the new species can be clearly differentiated from O. *Macleayana* on several grounds. Haswell (1882) has pointed out that the three posterior pairs of peraeopods in O. *Macleayana* increase progressively in length, the fourth pair much longer than the third, and the fifth slightly longer than the fourth. In the new species described hereunder the increment between the mean lengths of the third and fourth peraeopods is 0·6 mm whereas that of fourth and fifth peraeopods is 0·7 mm.

There is a difference too in palm structure. The palm of O. *australis* is smooth and slightly convex, whereas in O. *Macleayana* it has been described by

Haswell as waved. The latter species also possesses a small tooth on the posterior margin of the second joint of the fifth peraeopod. The telson of O. *Macleayana* has been described as triangular and blunt. As indicated above, the telson of the new species is pointed, fleshy, and deeply cleft.

DESCRIPTION OF MALE: Maximum body length recorded, 13·0 mm; for the sample of 20 specimens examined, the mean length was 8·8 mm (S.D. = 1·7); depth of body about one quarter of the length of body. Head short, broader than long; prominent epistome. Rostrum greatly reduced. Eyes round, well developed, darkly pigmented.

Antenna 1—Recorded variation in length ranged from 2·0 mm to 0·5 mm with a mean of 1·0 mm (S.D. = 0·4) for the 20 specimens examined. Antenna 1 reaching just beyond penultimate segment of peduncle of antenna 2; first segment a little shorter, but half as wide again as second segment; third segment as long, but three-quarters of the width of second segment; flagellum short, 4-segmented. Accessory flagellum absent.

Antenna 2—The recorded variation in length ranged from 6·5 mm to 2·0 mm with a mean of 3·4 mm (S.D. = 1·1); Antenna 2, about one-third length of body; first segment short, almost as long as broad; second segment about 2·5 times as long as first, a little narrower; third segment half as long again as second segment but about half as wide; flagellum slightly shorter than the peduncle, about 20-segmented; each segment bearing a pair of spines in each distal angle.

Mouth Parts—Upper lip minutely setose at apex of broadly rounded distal margin. Right mandible, cutting edge coarsely toothed with about three strong teeth; secondary process powerfully tricuspid in appearance; spine row absent; molar process strongly denticulate, obliquely oriented. Left mandible, similar to right, secondary process not tricuspid in appearance but consisting of a 5-toothed blade. Molar process vertically oriented. Palp absent.

Maxilla 1, inner plate almost as long as outer, tapering to half its width at apex, heavily spined; outer plate broadening from base, about twice basal width at apex, heavily spined at truncated end; palp 1-segmented, terminating in two long setose spines. Maxilla 2, inner plate slightly shorter than outer, with a distal row of setose spines; outer plate a little wider than inner with a row of spines at the rounded end. Maxillipeds, inner plate small, with several rows of setose spines on rounded distal border and along inner surface; outer plate subovate, reaching almost to end of third segment of palp, the long curved inner margin furnished with several rows of heavy spines which lack setation; basos twice the length of ischium; palp consisting of three segments; the first segment about as long as ischium, a cluster of spines in the inner distal angle; second segment about as long as first, but considerably broader, the inner distal angle produced to form a heavily-spined protrusion, a small group of spines at the outer distal angle; third segment broadly ovate, heavily spined along distal margin, a pair of long simple spines at about two-thirds of distance along outer margin.

Gnathopod 1—Subchelate. Segment 1 subtriangular, margin slightly curved, lower posterior margin furnished with short spines. Segment 2 elongate, somewhat constricted proximally, length about three and one half times maximum breadth; mid-posterior surface bearing two short simple spines, a single short spine at the postero-distal angle. Segment 3 slightly longer than broad, subrectangular in shape, a cluster of short spines at the postero-distal angle. Segment 4 slightly longer than segment 3, posterior surface elongate, convex and sparsely

spined, bearing a prominent rounded projection a little more than half way along its length. Segment 5 about one and one half times the length of segment 4, posterior surface expanded considerably, a cluster of short simple spines at the antero-distal angle. Segment 6 shorter than segment 5, widening distally. Finger matching the transverse palm, but not covering the produced part of the distal surface of palm. Segment 6 liberally spined on all surfaces.

Gnathopod 2—Subchelate, larger than gnathopod 1. Segment 1 sub-circular, fringed with short simple spines. Segment 2 longer than segment 1, subtrapezoidal, spined along posterior margin. Segment 3 about one quarter of length of segment 2 and half as wide, the anterior distal angle produced to form a rounded projection. Segment 4 subrectangular, as long as segment 3, but slightly narrower, a short simple spine in the postero-distal angle. Segment 5 small, subtriangular. Segment 6 large, nearly as long as segment 2 and twice as wide, broadly ovate; palm oblique, slightly convex, profusely spined. Segment 7, well developed, slightly curved, not extending beyond palm of segment 6.

Peraeopod 1—Segment 1 quadrate, lightly spined along margins. Segment 2 elongate, subrectangular, lightly spined on both anterior and posterior margins. Segment 3 about one-sixth length of segment 2. Segment 4, elongate, spined on both anterior and posterior surfaces. Segment 5 about two-thirds length of segment 4, similarly spined. Segment 6 as long as segment 5 but narrower and more heavily spined. Segment 7 short and curved.

Peraeopod 2—About the same length as peraeopod 1, very similar in structure.

Peraeopod 3—A little longer than peraeopod 2. Segment 1 bilobed. Segment 2 greatly expanded posteriorly. Segment 3 small with a single stout spine at the antero-distal angle. Segment 4 more than twice as long as segment 3, greatly produced at the postero-distal angle, spined on anterior and posterior surfaces. Segment 5 shorter and narrower than segment 4, with clusters of stout spines along anterior surface, and a couple of stout spines at the postero-distal angle. Segment 6 as long as segment 5, but only half as wide, clusters of spines along both anterior and posterior surfaces. Segment 7 well developed and sharply pointed.

Peraeopod 4—Longer than peraeopod 3; similar in structure to peraeopod 3 except for segment 1 which consists of a single lobe.

Peraeopod 5—The longest (mean for 20 specimens 4·6 mm; S.D. = 1·1). Segment 1 ovate, smaller than that of peraeopod 4. Otherwise peraeopod 5 of similar structure to peraeopod 4, although segment 2 is not as greatly expanded as in peraeopods 3 and 4.

Pleopods—All alike, biramous, rami similar and longer than peduncle; inner ramus somewhat shorter than outer.

Uropod 1—Rami subequal in length, about two-thirds length of peduncle, bearing several stout spines apically and spined along outer margins, each ramus two-segmented, the distal segment being a small spine-like structure. Peduncle about six times as long as broad and lightly spined along both margins.

Uropod 2—Much shorter than uropod 1 and stouter in structure. Rami two-segmented as in uropod 1; the outer ramus slightly longer than the inner. Peduncle about as long as outer ramus, but twice as broad. Peduncles and rami equipped with a few heavy spines.

Uropod 3—Uniramous and the shortest of the three. Rami one-segmented, about two-thirds length of peduncle and much narrower, topped with a few spines.

Pedunele broadly expanded, spined along outer margin.

Telson—Triangular in shape; thick, fleshy and deeply cleft; equipped with substantial spines at apex.

Branchiostegites—Simple sac-like structures.

DESCRIPTION OF FEMALE: Maximum body length recorded, 11·5 mm; smaller than males of corresponding age.

Gnathopod 1—Subchelate. Segment 6 widening distally to transverse palm as in male.

Gnathopod 2—Chelate in female, shorter and more slender than in male. Segment 1 as in male. Segment 2 the longest, broadly convex on anterior surface, lightly spined on both anterior and posterior surfaces. Segment 3 subrectangular, about one-third of length of segment 2, and a little more than half its maximum breadth, produced slightly at the antero-distal angle. Segment 4 shorter and narrower than segment 3, the postero-distal angle broadly rounded and lightly spined. Segment 5 about as long as segment 3 and 4 together, the posterior surface greatly produced. Segment 6 produced at the postero-distal angle, a cluster of spines at the antero-distal angle; palm oblique, well furnished with spines. Segment 7 forming a short curved pointed finger which articulates with segment 6 to form a chelate appendage.

COLOUR: The animals are a light reddish-brown in colour in life, and lack any characteristic pigment markings.

TYPES: *Locality*—The holotype is a male specimen from a collection made on the rocky beach at Hastings on Western Port Bay in May 1963. The animals were found in the damp sand under stones in the inter-tidal zone.

Repository—The holotype (No. J. 160) and paratypes (No. J. 161) are lodged at the National Museum of Victoria, Melbourne, Australia.

VARIATION IN MATERIAL EXAMINED: Twenty specimens were examined, half of them being males. They varied in body length from 13·0 mm to 6·0 mm with a mean of 8·8 mm (S.D. = 1·7). Greatest variation occurred in the length of the second antenna which showed a standard deviation of 1·1 with a mean length of 3·4 mm and in the second and third uropods, the latter of which showed a standard deviation of 0·2 for a mean length of 0·5 mm.

DISTRIBUTION: Present Records—VICTORIA: *Lake King* (May, 1956). *Port Phillip Bay*: Altona (May 1963)—Fine sand; thick weed on beach; Canadian Bay (September 1963)—Rocks and coarse sand; Dromana (September 1963)— Sandy beach; very little weed; Kirk Point (April 1963)—Shelly beach; thick weed on beach; Mornington (September 1963)—Rocks; little sand or weed; Point Henry (April 1963)—Coarse sand; little weed; Port Arlington (April 1963)—Sandy beach; little weed; Queenscliff (April 1963)—Coarse sand; little weed; St. Leonard's (April 1963)—Coarse sand; weed scarce; Werribee (May 1963)—Rocky cliff face; no weed; stray wave action. *Western Port Bay*: Corinella (September 1962)—Rocky foreshore; little weed; Hastings (May 1963)—Muddy foreshore; weed piled on beach; Lang Lang (September 1962)—Muddy foreshore; no weed; Point Leo (May 1963)—Fine sand and pebbles; some small rocks; San Remo (September 1962)—Sandy beach; no weed.

ECOLOGICAL NOTES: The species was recorded in a great variety of habitats ranging from the marine waters of Port Phillip and Western Port Bays to terrestrial conditions, as with the type specimens which were collected from damp seaweed on the sandy beach at Hastings on Western Port Bay. The animal was also

collected from the euryhaline waters of Lake King in Gippsland where it was observed burrowing in the submerged sand.

The ubiquitous Talitrids are to be found on almost all coasts, chiefly between tide marks or not far above or below them. Moreover, these forms sometimes reach to considerable altitudes; e.g. *Talitrus sylvaticus* has been observed on Mount Kosciusko, New South Wales, Australia, and on Mount Wellington in Tasmania, Australia, while others have been found at considerable depths in lakes (Stebbing, 1906). The family has also been recorded by Nicholls (1938) in the waters of the Antarctic region.

Hale (1929) describes the ubiquitous nature of the family in the following terms—'This is, of all the Amphipoda, the family which has made the strongest effort to place itself in evidence and to overcome the disregard of a neglectful world. More than any of the tribe it has invaded the land, so that its representatives may be found, not only in the sand-hillocks above high water mark, but in gardens, in woods far from the sea, on hills, and in craters of extinct volcanoes. It has climbed higher than any of the Crustacea except a few wood-lice, some of the fresh-water forms having been taken at a height of more than thirteen thousand feet in the Great Andes.'

Four Talitrid genera were recorded in Australian waters by Hale (1929), viz. *Talitrus*, *Talorchestia*, *Orchestia* and *Chiltonia*. Species of these forms occur on the sea shore, on land in damp conditions, and in fresh water. *Orchestia marmorata*, the Large Sand-hopper, for example, occurs under sea weed between tide marks on Tasmanian and South Australian beaches, while *Chiltonia subtenuis* is a species which is very prevalent in the South Australian regions of the Murray River.

ANATOMICAL STATISTICS OF *Orchestia Australis* (n. sp.)

Characteristic	Maximum (mm)	Minimum (mm)	Mean (mm)	Standard Deviation	Length of appendage/body length ratio
Body length (Rostrum to telson)	13·0	6·0	8·8	1·7	—
Antenna 1	2·0	0·5	1·0	0·4	0·1
,, 2	6·5	2·0	3·4	1·1	0·4
Gnathopod 1	3·5	1·8	2·4	0·5	0·3
,, 2 ♂	5·5	2·8	3·9	0·8	0·4
,, 2 ♀	3·5	2·3	2·8	0·5	0·2
Peraeopod 1	4·0	2·0	3·1	0·5	0·3
,, 2	4·3	2·0	3·0	0·6	0·3
,, 3	4·8	1·8	3·3	0·6	0·4
,, 4	5·5	2·5	3·9	0·9	0·4
,, 5	7·0	3·0	4·6	1·1	0·5
Uropod 1	2·5	1·0	1·7	0·4	0·1
,, 2	2·0	0·75	1·0	0·3	0·1
,, 3	1·0	0·25	0·5	0·2	0·1
Pleopod 1	3·5	1·75	2·4	0·5	0·3

Family OEDICEROTIDAE

Exoediceros fossor (Stimpson), 1855

BRIEF DESCRIPTION: This species is distinguished by the following features: The first antennae have peduncular segments which are successively shorter, and the accessory flagellum consists of a blunt segment tipped with long setae. The second gnathopod is larger than, but similar to, the first with the fifth segment

distally widened and setose. Peraeopods 1 and 2 lack fingers, peraeopods 3, 4 and 5 have the second segment oval and quite setose, and peraeopod 5 is elongate and greatly expanded. The eyes are well developed and variable in position.

VARIATION IN MATERIAL EXAMINED: Twelve specimens of *Exoediceros fossor* were examined, 5 of which were males. They varied in length from 8·0 mm to 4·0 mm with a mean of 5·6 mm (S.D. = 1·3). The greatest variation occurred in the length of the fifth peraeopod which displayed a mean length of 3·8 mm (S.D. = 1·0).

DISTRIBUTION: Previous Records—SOUTH AUSTRALIA: *St. Vincent's Gulf* (Haswell, 1882); *Spencer Gulf* (Sheard, 1937). NEW SOUTH WALES: *Port Jackson* (Haswell, 1882; Whitelegge, 1889; Stebbing, 1906).

Present Records—VICTORIA: *Anderson's Inlet* (May, 1963)—Fine sand; little weed; *Lake King* (October, 1956)— Fine and coarse sand; *Lake Tyers* (May, 1964)—Fine sand; no weed. *Port Phillip Bay*—Beaumaris (May, 1963)—Rocky; green algae abundant; Canadian Bay (May 1963)—Rocks and coarse sand; Dromana (May, 1963)—Sandy beach; little weed; Mordialloc (May, 1963)—Medium to fine sand; Rye (May, 1963)—Sandy beach; little weed; Sorrento (May, 1963)—Sandy beach; little weed. *Western Port Bay*—Hastings (May, 1963)—Muddy foreshore; weed piled up; San Remo (May 1963)—Sandy beach; no weed; Shorcham (May 1963)—Sandy beach; some weed; Summerland (May 1963)—Very rocky; weed in rock pools.

ECOLOGICAL NOTES: *Exoediceros fossor* has been found in a wide variety of habitats ranging from the euryhaline sandy conditions of Lake King to the marine rocky conditions of Summerland, Western Port Bay. The animal has been observed burrowing in fine sands such as those of San Remo, Western Port Bay and Lake King, and in coarser sands such as those of Anderson's Inlet and Canadian Bay, Port Phillip. In Lake King, *Exoediceros fossor* was found in areas devoid of weed. The recorded temperature range was from 9°C to 22°C, and the chlorinity tolerance ranges from 15·8‰ to 9·2‰

ANATOMICAL STATISTICS OF *Exoediceros fossor*

Characteristic	Maximum (mm)	Minimum (mm)	Mean (mm)	Standard Deviation	Length of appendage/body length ratio
Body length (Rostrum to telson)	8·0	4·0	5·6	1·3	—
Antenna 1	3·5	1·5	2·3	0·7	0·4
,, 2	2·25	1·25	1·7	0·4	0·3
Gnathopod 1	2·5	1·25	1·5	0·5	0·3
,, 2 ♂	3·0	1·75	2·8	0·7	0·5
,, 2 ♀	2·5	1·25	1·6	0·5	0·3
Peraeopod 1	2·25	1·0	1·5	0·4	0·3
,, 2	2·25	1·0	1·5	0·4	0·3
,, 3	2·5	1·25	1·9	0·4	0·3
,, 4	3·0	1·5	2·3	0·6	0·4
,, 5	5·5	2·5	3·8	1·0	0·7
Uropod 1	2·5	1·25	1·7	0·4	0·3
,, 2	1·0	0·5	0·8	0·3	0·1
,, 3	1·75	0·75	1·1	0·3	0·2
Pleopod 1	2·5	2·5	1·8	0·5	0·3

Stebbing (1906) recorded the presence of *Exoediceros fossor* in Port Jackson burrowing in sand above high water mark. Other members of the family Oedicerotidae, however, have been recorded at considerable depths. Sars (1891), for example, observed *Monoculodes Packardi* (Boeck) at a depth of 100 fathoms, and also *Synchelidium intermedium* in the Trondhjemsfjord at 400 fathoms, together with other deep-water Amphipoda, while Stebbing (1906) recorded the presence of *Paroediceros macrocheir* at depths of up to 900 fathoms in the Arctic Ocean. Nicholls (1914) reported the presence of species of *Oediceroides* and *Methalimedon* in Antarctic waters.

Family Corophiidae

Corophium ascherusicum (Costa, 1857)

Brief Description: This species is characterized by having the segments of the urosome fused, with the first uropod inserted in a notch in the lateral margin. In the second antenna in the male, the third peduncular segment bears a large terminal tooth and a smaller one above it. In the first antenna, the flagellum is eight-segmented. The first pair of gnathopods are subchelate, with an oblique tooth on the inner margin of a stout dactyl. The second pair of gnathopods is simple with a stout, tridentate dactyl.

The first uropods are the stoutest and longest, with rami subequal. The second uropods have the inner rami as long as the peduncles, while the outer rami are shorter. In the third uropods, the peduncles are wider than long, with about three setae and a few bristles on the convex outer margins. The rami are ovate, with about 10 slender spinules on the distal margin.

The telson is subtriangular, but the apex is cut off and slightly concave. It is wider than long.

Variation in Material Examined: Of the 26 specimens examined there was little variability in length evident. The mean length was 3·8 mm with a standard deviation of 0·3. The fifth peraeopod is the longest of the appendages, with a mean length of 2·3 mm (S.D. = 0·2).

Anatomical Statistics of *Corophium ascherusicum*

Characteristic	Maximum (mm)	Minimum (mm)	Mean (mm)	Standard Deviation	Length of appendage/body length ratio
Body length (Rostrum to telson)	4·1	3·4	3·8	0·3	—
Antenna 1	1·8	1·6	1·6	0·2	0·4
„ 2	1·9	1·5	1·7	0·1	0·4
Gnathopod 1	1·4	1·2	1·1	0·1	0·3
„ 2 ♂	2·2	1·8	2·0	0·1	0·5
Peraeopod 1	2·0	1·8	1·9	0·1	0·5
„ 2	2·0	1·8	1·9	0·1	0·5
„ 3	1·2	0·8	1·0	0·1	0·3
„ 4	1·9	1·6	1·7	0·1	0·4
„ 5	2·5	2·1	2·3	0·2	0·6
Uropod 1	1·0	0·7	0·8	0·1	0·2
„ 2	0·4	0·3	0·3	0·1	0·1
„ 3	0·3	0·2	0·2	0·1	0·1
Pleopod 1	0·8	0·6	0·7	0·1	0·2

DISTRIBUTION: Present Records—VICTORIA: *Port Phillip*—Hobson's Bay (January 1963)—fine sand; little weed. *Yarra River Estuary* (January 1963)—coarse sand; rocks; little weed.

ECOLOGICAL NOTES: This form obviously has a reasonably great chlorinity tolerance for it was found both in the estuary of the Yarra River and several miles further south in Port Phillip Bay at Beaumaris. (Hobson's Bay).

It was found in both places among green algae attached to rocks, and was not observed to burrow in the sand which, in both environments, was rather coarse.

This lack of burrowing habit is to be expected in the light of the generally slender structure of the peraeopods.

This is a ubiquitous species which is commonly found in association with ships, buoys and around wharf structures. Hurley (1954) claimed that the present known distribution of the species traces out some of the major shipping routes, particularly those from England, through the Mediterranean and Suez Canal to South Africa. This is one of the main shipping routes to Australia and New Zealand. The presence of the species in the Yarra River Estuary and around the shores of Hobson's Bay through which Melbourne's shipping routes pass strengthens Hurley's claim.

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ERRATUM: In Part 1 of this paper [*Proc. Roy. Soc. Vict.*, Vol. 81, Pt. 1: 31-58] *Repository* for holotype and paratypes should read throughout, *National Museum of Victoria, Melbourne.*